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Profile of hematological abnormalities and its correlation with absolute CD 4 count and HIV viral load in HIV infected patients in a tertiary care hospital

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Abstract

Background: Anaemia, neutropenia, leucopenia, and thrombocytopenia are hematologic complications of HIV infection. These abnormalities are the major causes of morbidity and mortality in HIV patients. Haematological abnormalities may be the direct result of HIV infection or manifestations of secondary infections, neoplasms, or side effects of the therapy. It is necessary to identify and treat for haematological abnormalities to reduce the morbidity and mortality. For the sake of economical evaluation of the status of HIV disease stage and its progression, complete blood counts and peripheral smear has been suggested as the alternatives.

Materials and Methods: The present observational study was conducted in tertiary care institute located in Hyderabad, Telangana state over a period of 1 year from June 2021 to June 2022 including 100 cases of HIV infected patients.

Results: Individuals with low CD4 count < 200 cells/µl and high viral load had higher prevalence of anemia,neutropenia and Thrombocytopenia.

Conclusion: Though there were many studies been conducted across India on HIV manifestations, in majority of them, various aspects were addressed and the prime focus on the hematological manifestations were very limited.HIV viral load and absolute CD 4 count are the most essential biomarkers correlating to the stage of

HIV disease and its progression. But these tests are costlier.For the sake of economical evaluation of the status of HIV disease stage and its progression, complete blood counts and peripheral smear has been suggested as the alternatives, since they were significantly correlated with high HIV viral load and lower absolute CD4 cell counts.

Keywords: CD4 count, HIV viral load, Anemia, Neutropenia, Thrombocytopenia.

Introduction

Hematological abnormalities contribute to the morbidity and mortality associated with HIV and AIDS, that they hinder the treatment directed at HIV and the opportunistic infections and malignancies of AIDS. These would augment the risk of bacterial infection and affect the quality of life. Hence this study is designed to find out the spectrum of hematological abnormalities in HIV patients and their correlation with absolute CD4 count and HIV (RNA) viral load.

HIV viral load and absolute CD 4 count are the most essential biomarkers correlating to the stage of HIV disease and its progression.In HIV patients cytopenias are commonly noted. HIV infection in the mesenchymal stem cells of marrow leads on to the various bone marrow abnormalities. HIV infection leads on to a histiocytic reaction and further resulting in hemophagocytic syndrome. HIV also causes decrease in progenitor cells in the bone marrow.

Materials and methods

The present prospective study was undertaken over 100 patients of HIV infected for period of 1 year from June 2021 to June 2022 at general medicine department in kamineni academy of medical sciences and research Centre, Hyderabad. All Patients after obtaining a detailed medical history and physical examination the following investigations are done CD4 Count, HIV viral load Haemoglobin, Total count, differential count and Platelet count, Serological study for HIV infection.

Inclusion criteria

- Age above 18 years
- HIV infection confirmed by western blot or ELISA method
- Patient giving consent for the study
- Patients as both inpatient or outpatient

Exclusion criteria

- Patient refusing consent
- Incomplete investigations

Results

This study mainly aimed at viewing the haematological abnormalities ongoing in HIV infection and the impaction of these abnormalities in viral markers like absolute CD4 count and HIV viral load. We were successfully able to complete the study among 100 HIV infected individuals attending in our hospital. It was a cross sectional study done among both outpatient and in inpatients with their consent.

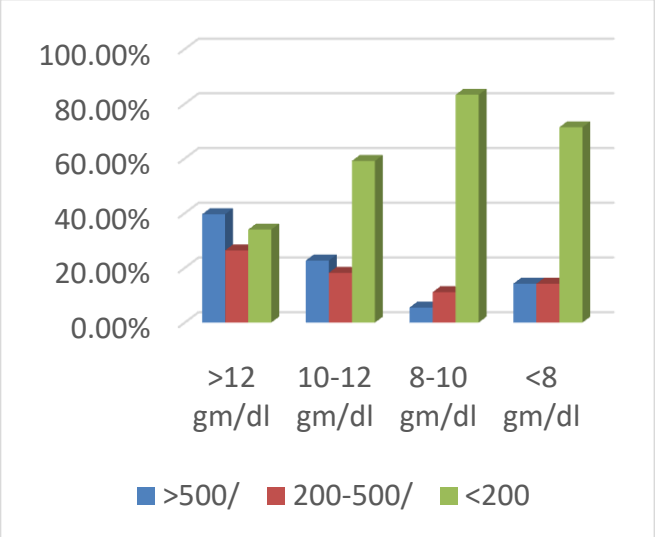


Figure 1: Haemoglobin Count Vs CD4 Count

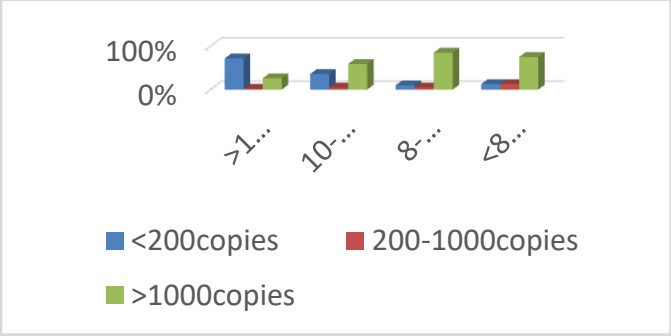


Figure 2: Haemoglobin Count Vs HIV Viral Load

Anemia

In this study there were significant association noted between low haemoglobin count and absolute CD4 count and HIV viral load. Individuals with high viral load and low CD4 count < 200 cells/ microlitre had higher prevalence of anaemia. Severe anemia was noted about 71.4% among CD 4 count < 200 cells/ microliter. Severe anemia was noted about 75% among viral load >1000copies/ml. The *p*-value is .000054. The result is significant at $p < .05$.

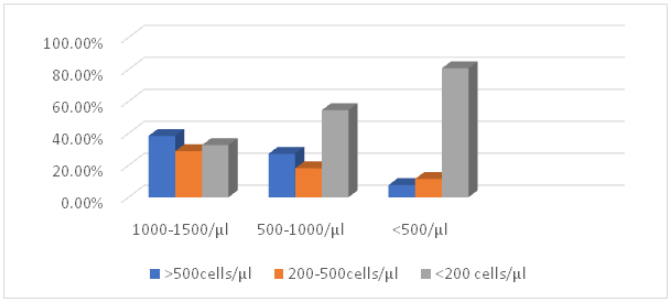


Figure 3: Absolute Neutrophil Count Vs Absolute CD 4 Count

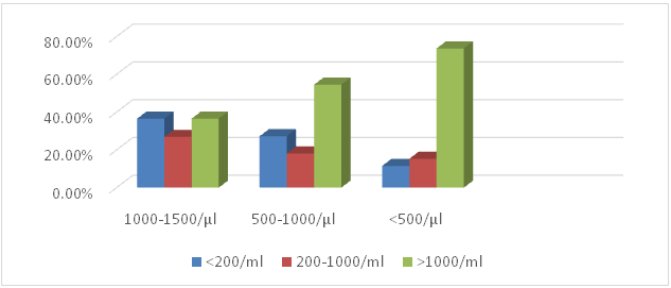


Figure 4: Absolute Neutrophil Count Vs Hiv Viral Load

Neutropenia

Severe neutropenia was noted about 80.7% among CD4 Count <200 cells/µl.Severe neutropenia was noted about73.7% among viral load >1000copies/ml.Among total samples, analysis of absolute neutrophil count and absolute CD4 count shows a p value of 0.002. Comparison of absolute neutrophil count and HIV viral load shows a p value of 0.042.

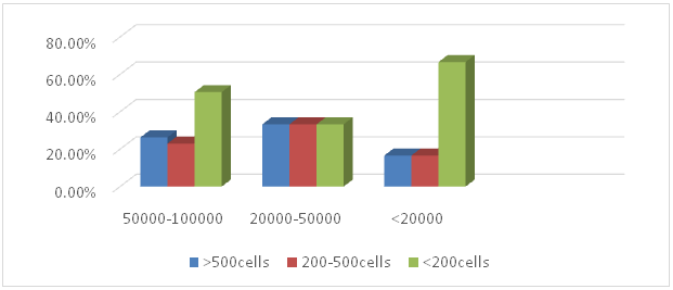


Figure 5:Platelet Count Vs Absolute CD 4 Count

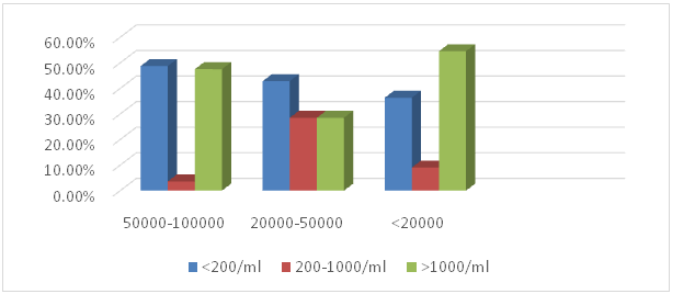


Figure 6: Platelet Vs HIV Viral Load

Thrombocytopenia

Severe thrombocytopenia was noted about 66.6% among CD 4 count < 200 cells/µl Individuals with low CD4 count < 200 cells/µl had higher prevalence of thrombocytopenia. Severe thrombocytopenia was noted about 54.5% among viral load >1000copies/ml. Individuals with high viral load >1000copies/ml had higher prevalence of thrombocytopenia. But the p value was insignificant.

Discussion

In this study, anaemia was more prevalent in individuals with high HIV viral load and low absolute CD4 count. This was the same like many studies quoted in the

literature review. Even the severity of anaemia was significantly correlated with high HIV viral load and low absolute CD4 count. These findings are consistent with study done by Volberding et al., who reported that more severe levels of anemia are found among HIV positive patients presenting with low CD4 counts.

Among the total cases, anaemia was more common than thrombocytopenia or neutropenia. The severity of anaemia, thrombocytopenia and neutropenia were reflecting the underlying immune status if interpreted cautiously. It will be of great benefit especially if the patient is in regular follow-up. Hence it is necessary to identify and treat for hematological abnormalities to reduce the morbidity and mortality.

Causes of anemia in HIV

- Inadequate production due to suppression of bone marrow by HIV infection
- treatment-related adverse events
- secondary to the opportunistic infections or neoplasms,
- preexisting medical issues
- RBC lysis due to autoimmune hemolyticanaemia ,DIC or thrombotic microangiopathy
- Nutritional deficiencies

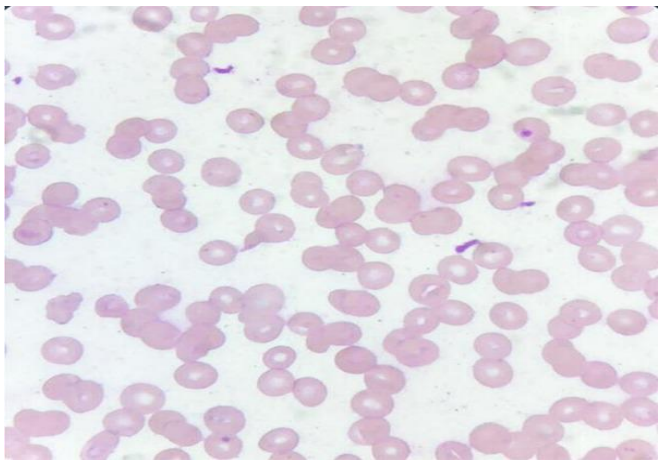
Causes of neutropenia in HIV

- Inadequate production due to suppression of bone marrow by HIV infection causing decreased granulocyte colony-stimulating factor levels, thereby causing lo granulocyte-macrophage lineage.
- treatment-related adverse events
- secondary to the opportunistic infections or neoplasms
- preexisting medical issues

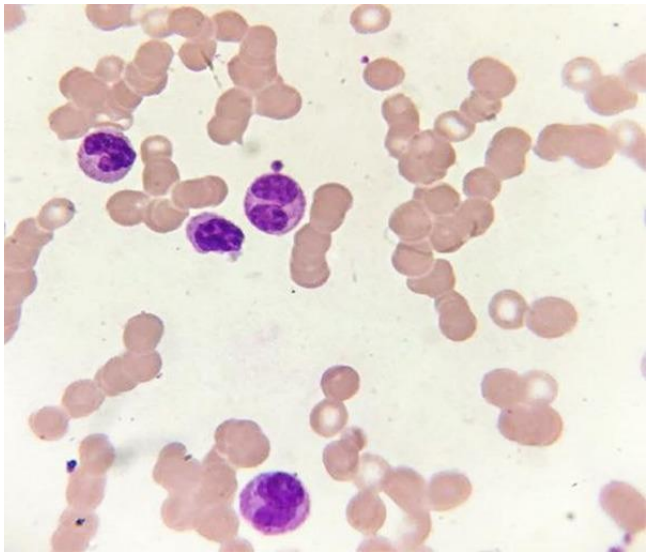
Causes of thrombocytopenia in HIV

- Immune-mediated destruction of the platelets
- Inadequate platelet production
- Auto -immune mechanisms by molecular mimicry causing cross-reaction of anti-HIV antibodies against platelet membrane glycoproteins.

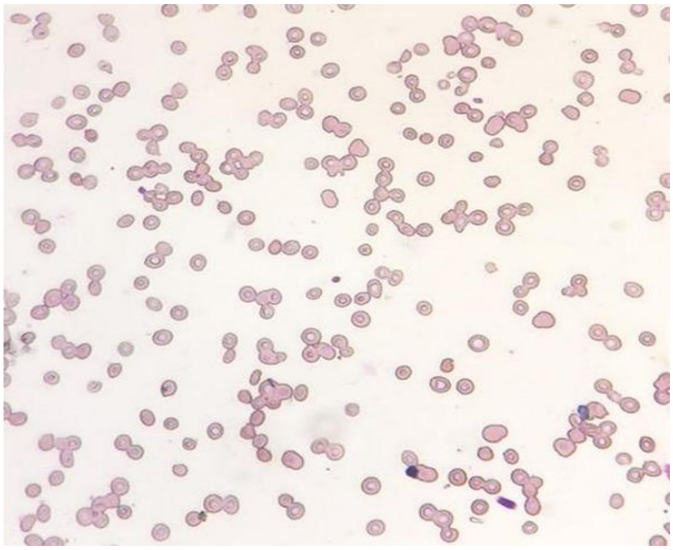
Peripheral blood smear shows the presence of normocytic normochromic anemia in a HIV patient



Peripheral blood smears showing presence of hypolobulated neutrophils and a bilobed neutrophil in a HIV patient



Peripheral blood smear shows the decrease in the number of platelets (thrombocytopenia) in a HIV patient



Conclusion

- Though there were many studies been conducted across India on HIV manifestations, in majority of them, various aspects were addressed and the prime focus on the hematological manifestations were very limited.
- HIV viral load and absolute CD 4 count are the most essential biomarkers correlating to the stage of HIV disease and its progression. But these tests are costlier.
- For the sake of economical evaluation of the status of HIV disease stage and its progression, complete blood counts and peripheral smear has been suggested as the alternatives, since they were significantly correlated with high HIV viral load and lower absolute CD4 cell counts.

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